

David H. Miller at the Milwaukee campus of the University of Wisconsin, recently began a 1-year appointment, under the National Oceanic and Atmospheric Administration's senior academician program at the National Climate Program Office. His duties will include an assessment of climate applications and the development of plans and programs to improve the effectiveness of the National Climate Program. ☐

[illegible][illegible]

velocity of 7 km/s and 6 km/s and an apparent  $Q$  of 2001 and 61). (4) A total seismic thickness of 43 km. The upper crustal layer, 1.5 km thick, is composed of a mixture of quartzite and gneiss, an altered equivalent of the continental crystalline basement that is normally 10 km to 20 km thick beneath the oceanic crust. (5) A 10-km-thick layer of gneiss and quartzite, which is the uppermost layer of the crust. As an isopropiolite from these layers, quartzite that is rich in quartz from the mantle has been found. (6) A 10-km-thick layer of gneiss and quartzite, which is the middle layer of the crust. This layer contains a variety of gneisses and quartzites, which are the result of the metamorphism of the upper crustal layer. (7) A 10-km-thick layer of gneiss and quartzite, which is the lower layer of the crust. This layer contains a variety of gneisses and quartzites, which are the result of the metamorphism of the middle crustal layer. (8) A 10-km-thick layer of gneiss and quartzite, which is the lowermost layer of the crust. This layer contains a variety of gneisses and quartzites, which are the result of the metamorphism of the lower crustal layer. (9) A 10-km-thick layer of gneiss and quartzite, which is the lowermost layer of the crust. This layer contains a variety of gneisses and quartzites, which are the result of the metamorphism of the lower crustal layer. (10) A 10-km-thick layer of gneiss and quartzite, which is the lowermost layer of the crust. This layer contains a variety of gneisses and quartzites, which are the result of the metamorphism of the lower crustal layer.

1970 Structure of the crust and upper mantle beneath the Yellowstone Plateau Geophysical Research Program: DATA AND APPRAISAL OF THE CRUSTAL STRUCTURE OF THE YELLOWSTONE REGION M. A. SCHUBERT, J. H. VAN DER BRUG, and R. L. JOHNSON, University of Utah, Salt Lake City, Utah 84142; N. B. Smith, U. W. Brails, and J. E. Peterson, University of Colorado

Eleven 1 km reflection profiles, recorded at distances of 100 km, and one seismic refraction profile were obtained from a 150-station array in the Yellowstone National Park during the 1976 Yellowstone-Seismicity Experiment. The profiles are interpreted in terms of the data suggest that the crustal P-wave velocity model for the Yellowstone region is characterized by: (1) all lower crustal velocities of 6.5-6.8 km/sec; (2) an average crustal layer V<sub>p</sub> of 6.8 km/sec; (3) a total crustal thickness of 30-35 km; and (4) a total crustal thickness of 30-35 km. These models are presented for profiles that emphasize the upper crust and show (1) a decrease in V<sub>p</sub> from 6.8 km/sec to 6.5 km/sec at depths of 10-15 km in southwest-trending Yellowstone core island areas; (2) a sharp increase in V<sub>p</sub> from 6.5 km/sec to 6.8 km/sec at the northeast side of the same area; (3) a thinning of the silicic surface volcanic zone to the northwest and (4) increased V<sub>p</sub> in the lower crust. Thermally interpreted as a low-velocity zone, with a decrease of at least 100°C over a vertical distance of 10 km, it is located in the northwestern corner of the Yellowstone Plateau. The low-velocity zone coincides with a local-J<sub>2</sub>-compression axis, gravely anomalous density pattern, and part of the Hot Springs Basin, the largest hydrothermal system in the park. It may represent a magma reservoir at the top of 3 km and a mafic diapir at the bottom of 3 km and may represent a remnant of the original magma chamber. Thermally inferred upper crust of the surrounding Rocky Mountain geologic units is also laterally inhomogeneous. In velocity and layer thickness supporting effects of thermal and magmatic processes. (5) The lower crust appears relatively homogeneous.



# The Oceanography Report



S. J. DEWITT

## The Oceanography Report

The focal point for physical, chemical, geological, and biological oceanography.

Associate Editor Arnold L. Gordon, Lamont-Doherty Geological Observatory, Palisades, New York, 10964 (telephone 914-359-2900, ext. 3251)

## Graduate Enrollment in Oceanography

Charles D. Hollister and John G. Sclater

Excellent job opportunities exist for well-trained Ph.D. graduates in marine geology, geophysics, chemistry, dynamical-physical oceanography, and oceanographic engineering.

This was one conclusion the deans of various schools of oceanography reached at a conference that included deans from Oahu University, Florida State University, the University of Hawaii, the University of Miami, Oregon State University, the University of Rhode Island, Scripps Institution of Oceanography, Texas A & M University, the University of Washington, and the Massachusetts Institute of Technology/Woods Hole Oceanographic Institution Joint Program in Oceanography. The results of this effort, combined with some of our own notions, form the basis of this short report. We hope that these thoughts will serve as a discussion base for more in-depth reflections.

The information supplied by each institution revealed that in the years just prior to the meeting in 1980 there had been too few qualified applicants in the fields of physical oceanography, geologic-geophysical oceanography, and ocean engineering to fill available vacancies. Each institution reported that over 50% of its total applicants were in biological oceanography. The supply of chemical oceanography applicants appeared matched to demand. Mathematics was generally found to be the principal weakness in many of the applications regardless of discipline.

On the demand side, there were found to be too few Ph.D.'s for the job market in all fields of oceanography except biological oceanography, although most well-trained (cross discipline) biologists had little trouble in this regard. Other statistics that emerged included (1) acceptance rate for offers of admissions averaged 50%, (2) average time to Ph.D. from B.S. degrees was about 6 years, and (3) drop out rate generally averaged about 25%.

Graduates who have the strongest background in the basic sciences were considered more attractive by recruiters, and those students who investigate a problem as it traverses disciplines seem to do better in the job market than those that confine their interests to the bounds of a single discipline.

The time, effort, and expense of recruiting certainly seem worthwhile, for institutions that did creative recruiting acquired a higher percentage of the candidates they had sought. Recent preapplication recruiting has substantially increased the number of good applicants to a given school. Success was also reported when active research scientists recruited in schools not already affiliated with oceanographic programs and in departments such as physics, math, chemistry, and engineering.

One recent proposal to AGU to do broad-scale, nationwide recruiting and tutoring about career opportunities in oceanography, in a nonschool specific fashion, has been declined. Thus it appears that each school will have to mount its own effort. Paid advertisements in school newspapers and journals widely read by undergraduates may be one way of initiating such an effort.

The prevailing Washington, D.C., mood, as reflected in the recent skirmish over NSF Graduate Fellowships, suggests that support for those fellowships will probably come under renewed attack next spring. It was concluded that graduate student support will be increasingly hard to find anywhere.

If present economic trends in this administration continue, we will have to rely even more heavily on the supply side of the economy to support the training process of our new scientists. Cross-sectoral linkages between industry and academia must be forged as soon as possible if industry expects to continue to reap the harvest of well-trained oceanographers that it has enjoyed up to now.

Charles D. Hollister is the Dean of Graduate Studies, Woods Hole Oceanographic Institution, Woods Hole, Mass. John G. Sclater is the Director of the Joint Program, Massachusetts Institute of Technology, Cambridge, Mass.

## Opinion

### Scientific Freedom and the Sea

As one of the small band of professional marine scientists who have actually been delegates to the UN Law of the Sea Conference and who have been actively involved in negotiating some of the texts, I was most interested to read David Ross' article on marine scientific research. (*Eos*, 62, Sept. 1, p. 652). I was particularly glad to see that he urged a constructive attitude toward what many scientists seem to feel is a totally unjustified attempt to curb their 'freedom.'

Two aspects of the negotiations were particularly important in this regard. First, it was found impossible to differentiate satisfactorily between academic, economic, or military research. Much marine research (for instance that concerning gravity or water column temperature) is equally valuable to all three. Much apparently 'scientific' research is carried out by academic personnel using commercial sub-contractors and supported by military funds. This is the conclusion were large gravity, magnetic, and bathymetric surveys carried out by the U.S. Navy and NATO over the continental shelves of many Atlantic and Mediterranean coastal states (without notification or consent) during the 1960's, presumably under the justification that they were primarily military in purpose and therefore not covered under the existing 1958 agreement.

The resentment and mistrust that was created among the smaller coastal states by this and similar kinds of action was the dominant atmosphere under which the early framework of the marine scientific regulations was laid down. Representing one of the smaller coastal states myself, I became aware of many other examples of abuse that had occurred in the name of scientific freedom by universities and agencies who believed that they were working for the greater good. The harvest of regulations which we now face is undoubtedly one which we ourselves planted. In my opinion, too many scientists forgot that what feels like freedom from the deck of a ship looks much more like arrogance when viewed from the shore.

Robin P. Riddihough  
Pacific Geoscience Centre  
Sidney, B.C., Canada

## Pondering Projections

The accompanying figure is an original 'World Map of Oceans and Seas,' plotted on one of a series of new equal-area projections (McBryde S3B2). Shown on the map are the areas of the 200-nautical-mile exclusive economic zone (EEZ), in true size relationships to one another. An equal-area map for such use is preferable to the Mercator conformal projection employed by the U.S. Department of State for its original map, which has been frequently reused, as in the September 1, 1981, 'The Oceanography Report' (David A. Ross, 'Marine Science and the Law of the Sea,' *Eos*, 62, p. 650). This is a common misuse of the invaluable Mercator Navigation Chart. Merely citing its high-latitude exaggerations cannot begin to rectify the enormous scale and size expansions and is no substitute for graphic comparability.

### WORLD OCEANS AND SEAS 200-NAUTICAL-MILE ECONOMIC CLAIM ZONES (SHADED)

Source: Global Effect of 200 Nautical Mile Zone Claims  
(on Mercator Projection)  
Office of the Geographer, U.S. Department of State



distributed by Transmaritime, Inc., Washington, D.C.  
McBryde S3 Equal-Area Rectangular Projection in Oceanic Latitudes  
Designed, drawn and 1977 by F. Webster McBryde  
Approximate equatorial scale 1:515,000,000

The S3B2 projection map presents the entire earth/surface features in mathematically true areal proportions, yet with minimized distortions of shape and scale, in oceanic sections, each having an independent mid-meridian. This projection is composed of two other juxtaposed equal-area world projections: (1) the Mercator Sinusoidal, for lower latitudes, with no scale error along parallels and mid-meridians, and (2) the McBryde-Thomas Flat-Polar Sinusoidal (derived from the first) for high latitudes, where extensions of polar lines one third the length of the equator reduce meridional compression east-west. This improves areal shapes and provides more polar plotting space. Straight horizontal parallels afford all-important latitudinal comparability. Such a map is recommended for plotting all areal data (e.g., the EEZ, oceanic depth zones, distribution of biomass of phytoplankton, ranges of botanical and zoological species and formations, sea ice, tectonic plates and trenches, continental shelf, slope and rise, mineral deposits, surface climatological data, and the like). For directional and angular plotting, sea of winds, ocean currents, and

tides, the conformal Mercator is best. (Note: These new equal-area projections, though patented, will be made available at no charge, upon request, for any noncommercial, scientific use.)

F. Webster McBryde  
Director  
McBryde Center for Human Ecology

## Information Report

### COSOD Opts for Explorer

With the withdrawal of industry support in the Ocean Margin Drilling Program (OMDP) (*Eos*, October 20, p. 705), a giant wave of uncertainty on the future of scientific ocean drilling swept over the oceanographic community. To steer the next decade's programs toward scientific objectives, the Conference on Scientific Ocean Drilling (COSOD) was held November 18-19 in Austin, Tex. The conference (scheduled before the industry decision) was sponsored by the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES), one of the principal operating arms of the Joint Oceanographic Institutions, Inc. (JOI).

A broad range of global scientific objectives were identified that require a worldwide drilling program for at least the next decade. Roger L. Larson, chairman of the COSOD Steering Committee, told *Eos* at the meeting's conclusion. 'Many of these objectives can be accomplished with the presently available drill ship *Glomar Explorer*, but the extended capabilities of the *Glomar Explorer* are required to accomplish a large number of other objectives. Thus, it was the unanimous consensus of the conference attendees that *Glomar Explorer* was clearly the preferable vessel for future scientific ocean drilling.'

This conclusion was one of the four basic options for OMDP that could have been reached: terminate ocean drilling in 1983 (the end of the current phase of the *Glomar Challenger*'s drilling); continue drilling with *Challenger* for another 5 years; substitute the *Glomar Explorer* for the *Challenger* to extend nonresearch drilling; and use the *Explorer* with full riser capabilities.

Larson added that the conference participants 'recognized that the availability of *Glomar Explorer* was subject to a yet-to-be-conducted cost analysis and that the drilling system would almost certainly be operated without a riser and blowout prevention system for at least several years. It was also recognized,' he continued, 'that future ocean drilling must be part of a larger scientific program that includes adequate support for planning, site surveying, geophysical experimentation, and sample analysis.'

This decision on the relative benefits of the two drill ships is the first of four steps enroute to deciding the future of scientific ocean drilling. Allen M. Shinn, Jr., director of the National Science Foundation's Office of Scientific Ocean Drilling, told the conference participants. The other steps are an assessment of the capital investments required to refurbish the *Challenger* versus those to convert the *Explorer*; 'acquire data on the comparative long-run operating costs of the two ships'; and an assessment of the level of commitment of our current and prospective IPOD (International Phase of Ocean Drilling) partners.

Larson explained that COSOD succeeded to reemerge the IPOD drilling alliance. The conference was attended by 150 earth scientists representing the United States, the United Kingdom, France, the Federal Republic of Germany, Japan, the Soviet Union, Norway, Canada, Australia, and The Netherlands.

COSOD also included workshop discussions of the origin and evolution of oceanic crust; the origin and evolution of marine sedimentary sequences; the tectonic evolution of continental margins and oceanic crust; the causes of long-term changes in the atmosphere, oceans, cryosphere, biosphere, and magnetic field; and the tools, techniques, and associated studies. Presentations from JOIDES panels rounded out the meeting's agenda. On the basis of these workshops, about a dozen scientific priorities were outlined. The COSOD Steering Committee was drafting its report on these priorities at *Eos*' deadline.

Once the scientific objectives for OMDP are finalized, part of the task of ensuring that the objectives are met would presumably fall to JOI, a consortium of 10 oceanic oceanographic institutions. Formed in 1976, JOI describes its duties as bringing 'the collective capability of individual institutions to bear on large oceanographic research projects.' The National Science Foundation contracts with JOI to plan and carry out OMDP's scientific activities.

So that each member institution has a voice in the OMDP science program, JOI established a Scientific Advisory Committee (SAC), according to William W. Hay, JOI president, and Thomas A. O'Leary, JOI chief scientist. To aid in its planning, SAC appointed five regional planning advisory committees and is in the process of forming five technical panels, which will be concerned with geophysical publications, logging and downhole measurements, sample curation and data management, and laboratory facilities. The primary objective for OMDP for the next few months will be to develop the science program, Hay and O'Leary emphasized.

In addition to its OMDP responsibilities, JOI is charged with providing scientific advice and guidance for the Deep Sea Drilling Project, under the aegis of JOIDES, and with carrying out the regional synthesis program, which involves the consolidation of geological and geophysical data collected during the last 20-30 years in 11 geographic regions targeted by SAC as candidate drilling sites. Hay and O'Leary explained. The data include bathymetric, gravimetric,

and magnetic information, depths as recorded by seismic reflectors, and descriptions of lithofacies.

The regional synthesis program involves approximately two dozen institutions. Nothing on this scale has ever been done, Hay said. 'It will provide a solid basis for OMDP.' The actual data synthesis is almost complete. Publication of the information, including maps, will be in approximately 2 years, Hay estimated.—BTR

## News and Announcements

### Travel Grants Program

The Ocean Sciences Board (OSB) of the National Research Council is sponsoring a travel grants program for U.S. scientists who are participating in the Third Joint Oceanographic Assembly (JOA), slated for August 2-13, 1982, at Dalhousie University in Halifax, Nova Scotia.

U.S. scientists, including U.S. citizens and foreign nationals holding permanent visas, who need funds to participate in JOA may apply. Scientists employed by a federal agency will not be considered. Travel grants will be based on round-trip excursion air fares plus registration fees. Participants will be expected to find other funds for accommodations and living expenses.

Applications will be evaluated by an ad hoc OSB panel. The panel's criteria for selection are scientific merit of the contribution, importance of the contribution to the success of the assembly, age (younger scientists will receive special consideration), and uniqueness of the contribution or its value for international research planning.

Applications should be sent to OSB, National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20418. Applicants should provide the following information in no more than two pages: name; professional address; phone number; birth date; principal sponsor(s) of research; title of paper, poster session, or other contribution (if an invited paper, specify session name and number and name of invited); abstract of paper or poster; and any other information that will help in the evaluation. Applications must be received before January 1. Applicants will be notified on or about March 15.

### Self Disposal Effects Found Small

Brine discharges into the Gulf of Mexico averaging more than 600,000 barrels per day for the past year have had 'few significant effects' on the marine environment off the Texas coast, according to a preliminary analysis by scientists and engineers at the Texas A&M University. The brine, 8 times saltier than the surrounding seawater, is produced when salt from underground deposits on shore is dissolved and pumped into the Gulf as part of the Strategic Petroleum Reserve Program.

## New Publications

### Thunderstorms

C. Magono, *Develop. Atmos. Sci.*, Elsevier, New York, x + 261 pp., 1980

Reviewed by Peter V. Hobbs

In the preface to this book, *Thunderstorms*, the author points out that a researcher in atmospheric electricity would be hard pressed to provide a simple, succinct answer to the question, 'Why does electricity form in clouds?' Certainly, after some 200 years of research, the subject is still notorious for its prolixity of theories and shortage of facts.

Magono concludes, rather gloomily, that future research is likely to lead to even longer and more complex answers to this question. A disturbing prospect to anyone who believes that obfuscation generally conceals ignorance.

However, the present book is designed to clarify rather than obscure. It provides a straightforward review of observational studies and theories on charge generation in clouds, lightning discharges, and methods of protection against lightning. The treatment is largely nonmathematical and should be readily comprehensible to the nonspecialist familiar with classical physics. There are only a few indications that the author's first language is not English; he generously describes this to the help of friends. Would that more scientists whose first language is English could write so well in a foreign language, even with help.

The book begins with a short potpourri of subjects, including the dynamics of thunderstorms, their microphysical and electrical structures, and the distribution of charges in thunderstorms. The section on dynamics could have been strengthened if a clear distinction had been drawn between the various types of thunderstorms (airmass, multicell, supercell, etc.). The American reader may be appalled to find no mention of Franklin in the discussion of the electrical structure of thunderstorms. But the history of the subject receives scant treatment throughout the book, a pity, since the author is in an excellent position to compare early western contributions with less well-known studies carried out in the Orient.

The heart of the book is contained in chapters 2-4 ('Pre-discharge Electricity,' 'Charge Generation in Thunderstorms,' and 'Non-Precipitating Thunderstorms and the Feedback Processes of Electric Fields and Precipitation'). These chapters provide detailed and up-to-date reviews of current understanding in these subjects. Most of the main theories for the electrical origin of cloud and precipitation particles and thunderstorms are described, although the author stealthily avoids committing himself to any one theory.

Lead by Roy Henn, Jr., of the Texas Engineering Experiment Station, the team is analyzing discharge from Bryan Mound at Freeport, Tex., and from the West Hackberry site near Cameron, La. After a year of discharge of Freeport, the researchers found 'no brine-caused differences in sediment temperatures and bottom-water dissolved-oxygen levels which accompany increased salinity.' Henn said. In addition, overall compositions of fish and shrimp remained stable.

'We are beginning to see a demonstrable, but not significant, environmental effect as a result of higher salinity,' Henn said. 'A few fish may be evolving the discharge area, but we are seeing no deaths or other harmful effects.' There were some effects on the density of plankton in the area, but Henn said these differences were not large when compared to normally high month-to-month fluctuations in the plankton population.

The group also found that after more than a year of discharge, records of salinity in the region 'were consistent with the overall physical oceanography of the area.' Nevertheless, most scientists involved agree that more analysis is needed before a final evaluation can be made.

## Meetings

### CMOS Meeting

The Canadian Meteorological and Oceanographic Society will hold its Sixteenth Annual Congress and Annual General Meeting at the University of Ottawa, Ottawa, Canada, on May 26-28, 1982. The theme of the meeting will be Sea Ice. In addition to invited and contributed papers relating to the general theme, sessions will be held on other aspects of meteorology and oceanography depending on contributions. Poster sessions may be held, depending on response.

Titles and definitive abstracts (less than 300 words) should reach the program committee by February 1. Send material to George Isaac, Cloud Physics Research Division, Atmospheric Environment Service, 4905 Dufferin Street, Downsview, Ontario M3H 5T4 (telephone: 416-667-4683). Please indicate whether the paper is suitable for presentation in a poster session.

Tours are planned, and commercial exhibits will be on display. Organizations interested in obtaining display space should contact Brian O'Donnell, Atmospheric Environment Service, Ottawa, Ontario K1A 0H3 (telephone: 819-997-3511).

### Oceans 82: Call for Papers

The Oceans 82 Conference and Exhibition will be held in Washington, D.C., on September 20-22, 1982. The confer-

ence's theme is 'Government, Industry, and Academia—Partners in Ocean Progress.'

A call for papers has been issued by the meeting's sponsors: The Marine Technology Society and the Institute of Electrical and Electronics Engineers Council on Oceanic Engineering. Requested are papers that highlight technological potentials and problems where successful realization could make significant contributions and that propose methods to foster ocean development. Among the 40 topics expected to be discussed are geology and geophysics, marine geodesy, ocean margin drilling, oceanographic ships, remote sensing from satellites and aircraft, seismic measurements, and water quality and pollution. Workshops, panel discussions, and an extensive exhibit of marine products and services also are planned.

For additional information and abstract forms, write to Oceans 82 Technical Program Chairmen, Suite 412, 1730 M Street, N.W., Washington, D.C. 20036. The deadline for abstracts is February 14.

## MARINE SCIENCE University of Miami

The University of Miami is searching for a Dean who will serve as the Director of its oceanographic and atmospheric institution which has 86 full-time faculty, 112 graduate and 305 undergraduate students, and a \$14 million budget. The main function of this position is to provide leadership to a thriving, multidisciplinary community of oceanographic researchers and students, including biological, chemical, physical and geological oceanographers, ocean engineers, atmospheric scientists and specialists in marine affairs. The person who directs this institution will be expected to promote its aims and provide liaison with federal agencies as well as private foundations, and to encourage new programs to meet the needs of both developed and developing nations, especially those of the Caribbean and South America.

Applications, including a current professional resume, nominations and further information should be sent to Dr. Norman G. Einspruch, Chairman of the RSMAS Dean Search Committee, University of Miami, School of Engineering and Architecture, P.O. Box 248261, Coral Gables, Florida 33124. Nominations and applications desired by December 15, 1981. Position will remain open until filled.

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Francis A. Richards, editor

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First announcement published in *Eos*, September 8.  
Deadline for application is December 15.



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## POSITIONS AVAILABLE

University of North Dakota. Applications are invited for two tenure-track appointments in the Department of Geology, beginning January 1982.

(1) petroleum geology or related fields (2) one of the following areas: low-temperature geochemistry, carbonate petrology, economic geology

The first position will include teaching 1 or 2 courses per year in petroleum geology. Both positions require teaching undergraduate and graduate courses in the areas of expertise, directing graduate student research at the MS and PhD levels, and developing an active research program.

The Department has one full-time faculty, two adjunct faculty, about 150 undergraduates and 50 graduate students. Association with the North Dakota Geological Survey includes access to complete subsurface records, cores and samples for 9,000 wells in the Williston Basin. Proximity to the Williston Basin and Canadian Shield provides abundant opportunity for research in sedimentary, igneous, and metamorphic petrology, and economic geology. Excellent physical facilities, the state core and sample library, and excellent photo, map, and book collections are available.

The PhD is required, salary and rank are open and competitive. Applications will be accepted until suitable candidates are found. Applicants should submit complete resumes, including education, previous experience, teaching and research interests, and at least three letters of reference to Dr. Richard O. LeFevre, Chairman, Search Committee, Department of Geology, University of North Dakota, Grand Forks, ND 58202.

South Dakota School of Mines and Technology. Applications are invited for two positions in the Department of Geological Engineering. Both involve teaching at undergraduate and graduate levels, thesis direction and development of research.

Geological Engineering specialty in rock or soil mechanics, site evaluation, geophysics, petroleum reservoir engineering or engineering seismology. Industrial design experience preferred. A PhD in some area of engineering is preferred.

One Deposits area of specialization is open. The successful applicant will work closely with the newly established Institute for the Study of Mineral Deposits. The PhD is required.

The Department has an undergraduate enrollment of 170 majors and a graduate enrollment of 60. Field applications of geology and engineering are emphasized. Interested persons should send a resume and three letters of recommendation to: Attn: Lisenbee, Dept. of Geological Engineering, South Dakota School of Mines and Technology, Rapid City, SD 57701.

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Resources or Mineral Economics. The Department of Engineering and Public Policy at Carnegie-Mellon University is seeking to add a new faculty member at the level of assistant professor in resource or mineral economics to work in collaboration with engineering-based research programs primarily in mineral policy but possibly also in hazardous materials, energy systems, and environmental systems. There are no reasonable prospects for a joint academic appointment with either the School of Urban and Public Affairs or the Department of Social Science. Send resume with list of publications and statement of research interests to:

Dr. Indira Nar, 101222, Department of Engineering and Public Policy, Carnegie-Mellon University, Pittsburgh, PA 15213. CMU is an equal opportunity employer.

Princeton University. A research position is available beginning 1 January 1982 in the Department of Geological and Geophysical Sciences for research on the effects of the atmosphere and oceans on the Earth's climate system. Past experience in Earth rotation problems and global geodesy techniques as well as familiarity with meteorological data sets is required. Send resumes to: A. Dahlen, Department of Geological and Geophysical Sciences, Princeton University, Princeton, NJ 08544.

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Peouly Position in Geophysics/Structural Geology/Engineering Geology. The Department of Geological Sciences of Case Western Reserve University in Cleveland, Ohio is seeking candidates to fill an anticipated faculty position in the broadly defined areas of geophysics/structural geology-engineering geology. While field of specialization is open, the successful candidate will be charged with conducting the Department's teaching programs in geophysics at the graduate and undergraduate levels, in addition to carrying out a vigorous research program. Ample opportunities exist for research collaboration both within the Department of Geological Sciences and with faculty members in the School of Engineering.

Ph.D. or equivalent is required. Please submit applications, consisting of resumes, names of three references and a statement of research and teaching interests to:

Samuel M. Sevin, Department of Geological Sciences, Case Western Reserve University, Cleveland, Ohio 44106.

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Streeter Geology/University of Illinois at Urbana-Champaign. (Search reopened) The Geology Department is seeking a structural geologist for a tenure-track (assistant professor) faculty position. A Ph.D. is required. Salary open. The successful candidate will be expected to teach advanced undergraduate and graduate courses in structural geology and establish a research program. For equal consideration, applications, including the names of three references, should be sent by February 1, 1982 to Dr. D. E. Anderson, Department of Geology, University of Illinois, 245 Natural History Building, 1301 West Green Street, Urbana, IL 61801-2999, (217) 333-6713.

Position to be filled by September 18, 1982. The University of Illinois is an affirmative action equal opportunity employer.

Hydrology/Tenure Track Position of Assistant or Associate Professor Level. Candidate should be a specialist in some quantitative aspect of hydrology with demonstrated skills in formulating hydrologic models, and a background in teaching hydrology. Academic or professional credentials at PhD level required. Starting date negotiable but could be as early as August 1, 1982. Resumes, etc., should be received by March 1, 1982. Interested persons should request job description from Dr. E. S. Simpson, Chairman, Search Committee, Department of Hydrology and Water Resources, University of Arizona, Tucson, Arizona 85721.

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Seagoing Research Assistant in Physical Oceanography. Applications invited for a position in the School of Oceanography, Oregon State University, D.S. in physics or engineering. Must have strong computer experience, needs some familiarity with computers and electronic instruments. Must be able to assume position by 15 February 1982. Appointment will be for a year or more. Salary, \$20,000 or more depending on experience. Submit application and names of three references by 25 December 1981 to: Douglas R. Caldwell, School of Oceanography, Oregon State University, Corvallis, OR 97331.

An affirmative action/equal opportunity employer.

Theoretical Geophysics/Seismologist. The Department of Geological Sciences at Southern Methodist University is seeking to fill a faculty position to establish programs of research and graduate undergraduate teaching. A position will be filled in one of the following fields:

(1) Theoretical Geophysics—possible fields of interest are inverse theory, digital data processing or numerical modeling. Applications to seismology, gravity, magnetics, or geodetic methods preferred.

(2) Seismology—preferred interests in reflection seismology, possibly in data acquisition and interpretation. Industry experience and/or willingness to interact with local exploration geophysicists is desirable.

These positions are part of a program to expand the existing geophysics group which consists of two senior faculty members, several Ph.D. research associates and technicians. The Mathematics Department has on excellent numerical methods group of four faculty members which encourages interaction with the applied sciences. Computer facilities are excellent consisting of CDC Cyber 73 and CDC 6600 main frame with remote access CRT, Tektronix graphics and hard copy terminals within the Department. The Department also houses a Nova 4, a POP II, several other microcomputers and is in the process of installing a VAX system for geophysical data processing. Several major interaction with these and other local geophysicists is encouraged together with a reasonable amount of consulting. Academic rank and salary are negotiable and considerable flexibility exists in the area.

Send resume and names of 3 references to: M. J. Holdaway, chairman, Department of Geological Sciences, S.M.U., Dallas, TX 75275.

S.M.U. is an affirmative action/equal opportunity employer.

Yale University/Department of Geology and Geophysics. Applications are solicited for a faculty position in solid earth geophysics to begin in the academic year 1982-83. Areas of interest in the Department include seismology, exploration geophysics, mechanical and physical properties of rocks and minerals, geomagnetism, and tectonics.

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Curriculum vitae, publications and the names of three or more references should be sent by 31 October 1981 to Robert B. Gordon, Chairman, Department of Geology and Geophysics, P.O. Box 6868, New Haven, CT 06511.

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Send resume, statement of future research interests, and names of at least three references to: Larry Haskin, Chairman, Department of Earth and Planetary Sciences, Washington University, St. Louis, MO 63130. Applications received through February 15, 1982.

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## AGU

John F. Dewey—Tectonics Editor

I want the journal to acquire a reputation for very rapid, fair, and accurate reviewing," asserted John F. Dewey, editor-in-chief of AGU's newest journal, *Tectonics*. Dewey said that he will rule the bimonthly, which will begin publication in February, "with a bit of a rod of iron" to ensure that *Tectonics* is "where only original and important papers are published."

"I'm going to be very strict with reviewers," Dewey explained in his quick British clip. "If the review does not come back to me within 10 days to 2 weeks, I'll review the paper myself. I'm also going to have a system whereby, if a paper needs major surgery after being refereed, it will be rejected. Papers will have to be in virtually publishable condition before they are first submitted," he said.

A rapid reviewing process and a demand for high-quality papers will distinguish *Tectonics* from other journals that touch on the field, Dewey said. The new journal also will carve out its niche by being heavily weighted toward the geological aspects of plate tectonics. "There's no other journal that emphasizes that aspect," he noted. He also pointed out that *Tectonics* will not detract from the red section of the *Journal of Geophysical Research*. While JGR-Red concentrates on the geophysics of tectonics and marine plates, Dewey wants to emphasize continental tectonics.

Concerned with high standards, Dewey talks about the birth and growth of *Tectonics*: "I'll be very happy once the journal has, say, two years of line issues under its belt. It takes six months or a year or even two years to accelerate to get a line journal going."

February's issue will include six or seven papers, but Dewey said he aims for high quality, not quantity, of papers. "I don't care if we only publish four or five papers an issue, provided those papers are truly first rate."

Aiding Dewey will be Paul Tappanier as European editor and B. Clark Burchfiel as North American editor. A board of associate editors will assist them.

Dewey, a native of London, received Ph.D. and D.I.C. degrees in 1960 from Imperial College, University of London. He lectured on structural geology at the universities of Manchester and Cambridge from 1960 to 1970, and then he joined the State University of New York at Albany.



John F. Dewey

In 1967 he came to North America on sabbatical as a visiting research associate at the Lamont-Doherty Geological Observatory. "It was just luck that I happened to be on sabbatical at the right place at the right time," Dewey said. It was then that some of the scientists—such as Xavier Le Pichon, Walter Pittman, and Lynn Sykes—vital to the development of plate tectonics were at Lamont working on the theory. "I learned a massive amount from these people, including a whole new methodology for the science of geology. In a period of about three months," Dewey reflected, "my attitude towards geology was transformed," to viewing it in terms of plate tectonics.

In 1980 he was promoted to distinguished professor at Albany. This Christmas he will step down from that post to become professor of geology at the University of Durham in England and research professor at Albany. He will continue to pursue his current research, which includes study of the neotectonic evolution of Anatolia; the structural history of the Etr, Ete, and Silivette nappes in eastern Switzerland; tectonophysics and thermal evolution of rift basins and hydrocarbon maturation; and the tectonics of overthrust belts and the evolution of foreland basins. Dewey also plans to write a graduate textbook on the principles of plate tectonics.

"What I would like to look back on in 20 years when I retire," Dewey said, "is to see a row of *Tectonics* issues that essentially would form a handbook that would be the first place people would look for the critical data on and synthesis of the regional tectonics of the world." —BTR

## Meetings

## Physics and Chemistry of Ice

The Sixth International Symposium on the Physics and Chemistry of Ice will be held on the Rolla Campus of the University of Missouri on August 2-6, 1982. The symposium, to be convened for the first time in the United States, will cover fundamental studies of ice phases, experimental and theoretical work, and investigations that depend in part on the properties of ice (including meteorology, atmospheric electricity, glaciology, planetary modeling, engineering problems caused by climate forces, and the biological effects of ice formation).

Other topics to be covered include diffusion and relaxation phenomena, lattice dynamics, electrical and mechanical properties, ice evolution, extraterrestrial ice, surface structure and properties, ice chemistry, and geological evolution as revealed by ice samples.

Abstracts must be written in English and include authors' names, paper title, and a two- or three-sentence summary; deadline is January 15. Extended abstracts and registration forms are due May 1. Registration fees are \$75 for professionals and \$25 for students. A \$25 late fee will be charged for registration received after May 1. Questions on the technical program should be addressed to the conference chairman, Patricia L. M. Plummer, Graduate Center for Cloud Physics Research, 109 Norwood Hall, University of Missouri, Rolla, MO 65401 (telephone: 314-341-4340). Information about the social program, registration, and housing can be obtained by writing to the coordinator, Martha For, 105AH/SS, University of Missouri, Rolla, MO 65401.

The conference is sponsored by the American Physical Society, the American Chemical Society, the American Meteorological Society, and the International Commission on Snow and Ice of the International Union of Geologists and Geophysicists.

## National Aerospace Meeting of The Institute of Navigation

by Patrick Fell

The program for this year's aerospace meeting of The Institute of Navigation addressed developments in the evolving Global Positioning System (GPS) of navigation satellites, inertial navigation systems, and other electronic navigation systems and their applications. Also included in the program were a limited number of papers addressing the geodetic use of the GPS system.

The Global Positioning System is a constellation of 18 navigation satellites being developed by the Department of Defense to provide instantaneous worldwide navigation. The system will support a multitude of military applications. The first paper by Jacobson reviewed the engineering development of GPS navigation receivers stressing the use of common hardware and software modules. A later paper by Ould described the mechanization of a digital receiver for GPS applications designed for faster acquisition of the spread spectrum satellite transmissions than analog receivers. The paper by Brady discussed the worldwide coverage that is provided by the limited number of satellites that will constitute the GPS constellation through 1983. The capability provided by the satellites presently on orbit would support a variety of experiments at almost any location. Tables of multiple satellite visibility are provided for numerous worldwide locations. For civil aviation applications, Vogel addressed the satellite geometry considerations for low cost GPS user equipment. Esposito described the Federal Aviation Administration acceptance tests of a GPS navigation receiver, and Hopkins discussed the design and capability of an integrated GPS strapdown attitude and heading reference system for avionics.

Geodetic applications of the GPS system to mapping, charting, and geodesy were summarized by Senus, who described two programs under development by the Defense Mapping Agency. These include the first GPS receiver for space application aboard a future NASA LANDSAT mission and the testing and development of geodetic receivers for terrestrial surveying operations. This latter program is jointly sponsored by DMA, NASA, USGS, and NOAA/NGS. The paper presented by Evans described the accuracy obtainable for estimating changes in geodetic receiver antenna positions using GPS Doppler techniques.

A second major area of discussion was inertial navigation systems and related topics. A paper by Gierdine presents a comparative study of algorithms used in strapdown navigation systems. Hung discussed the effect of acceleration errors caused by vehicle rotations when strapdown navigation systems are not located at the center of rotation. Bachman presented flight test results for the ring laser gyro navigator, and DiPasqu discussed the design definition for an advanced inertial sensor system. Other papers dealing with hybrid strapdown systems, navigation systems planning, memory requirements for aerospace navigation systems, and aircraft velocity sensing were presented.

Another collection of papers dealt with other electronic navigation systems. One such system, the Joint Tactical Information Distribution System (JTIDS), is a defense communications system providing the means for obtaining accurate range measurements to support relative navigation. Papers by Weiss and Rome described navigational aspects of this system. A paper by Gupta discussed Omega signal selection, and Rome discussed error and decision analysis for the BCAS aircraft collision avoidance system. Gerz-Robles presented a paper on an autonomous Doppler position

## Scholarship Assistance for Minority Students in Earth, Space, and Marine Science For 1982-1983

The American Geophysical Union is once again pleased to participate in the American Geological Institute's Minority Scholarship Assistance Program.

## Eligible Candidates are:

- Graduate or undergraduate students with good academic records
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For applications, write to:

William H. Mathews III, Director of Education • American Geological Institute • Box 10031, Lamar University Station, Beaumont, Texas • 77710

Application Deadline, February 1, 1982

## AGU CHAPMAN CONFERENCE

## RAINFALL RATES

April 27-29, 1982 Urbana, Illinois

Convenor: D. M. Hershfield

## Sessions planned:

- Atmospheric physics as related to rainfall processes
- Measurement: mass (flipping bucket), photoelectric, magnetic, and remote methods
- Models: physical, meteorological, and statistical
- Applications: point, area, quasi-horizontal path surface, troposphere, and stratosphere

Call for papers published in EOS, July 14. Abstract deadline: December 21, 1981.



## tectonics

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loring system using the NIMBUS-6 satellite, which focuses moored or free-floating buoys and weather balloons from a single satellite pass.

The meeting was informative for the participants, primarily addressing navigation, but offered some useful information to some in the AGU community. A volume of the proceedings is available from The Institute of Navigation, Suite 832, 815 15th Street, N.W., Washington, D.C. 20005.

This meeting report was prepared and submitted by Patrick Fell of the Space and Ocean Geodesy Branch, Space and Surface Systems Division, Naval Surface Weapons Center, Dahlgren, Va.

## Ocean Sciences: AGU/ASLO Joint Meeting



A joint meeting of the American Geophysical Union's Oceanography Section and the American Society of Limnology and Oceanography will be held February 16-19, 1982, in San Antonio, Texas.

**Registration.** Everyone who attends the meeting must register. Preregistration (received by January 29) saves you time and money, and the fee will be refunded if AGU receives written notice of inability to attend by February 8.

Registration rates are as follows:

	Preregistration	At Meeting (after 1/29)
Member	\$55	\$70
Student Member	\$25	\$40
Nonmember	\$75	\$90
Student nonmember	\$32	\$47

Registration for 1 day only is available at half the above rates. Members of American Geophysical Union, American Society of Limnology and Oceanography, Marine Technology Society, and American Meteorological Society may register at the member rates.

The difference between member (or student member) registration and nonmember registration may be applied to AGU dues if a completed membership application is received at AGU by May 19, 1982. Current AGU annual membership rates are: \$20 members; \$7 student members.

To preregister, fill out the registration form, and return it with your payment to the AGU Office. Your receipt will be included with your preregistration material at the meeting. Preregistrants should pick up their registration material at the preregistration desk at the El Tropicano Hotel, headquarters for the meeting. Complimentary badges for guests not attending the scientific sessions will be available at the registration desk.

**Hotel Accommodations.** Blocks of rooms are being held at the El Tropicano, the St. Anthony, and the Gunter hotels. Read the housing application and MAIL THE COMPLETED APPLICATION FORM TO THE HOUSING DEPARTMENT, San Antonio Convention and Visitors Bureau, P.O. Box 2277, San Antonio, Texas, 78298. MAIL EARLY to insure confirmation at your preferred hotel. DEADLINE FOR RESERVATIONS IS JANUARY 15, 1982. Please do not write or call the AGU office for room reservations.

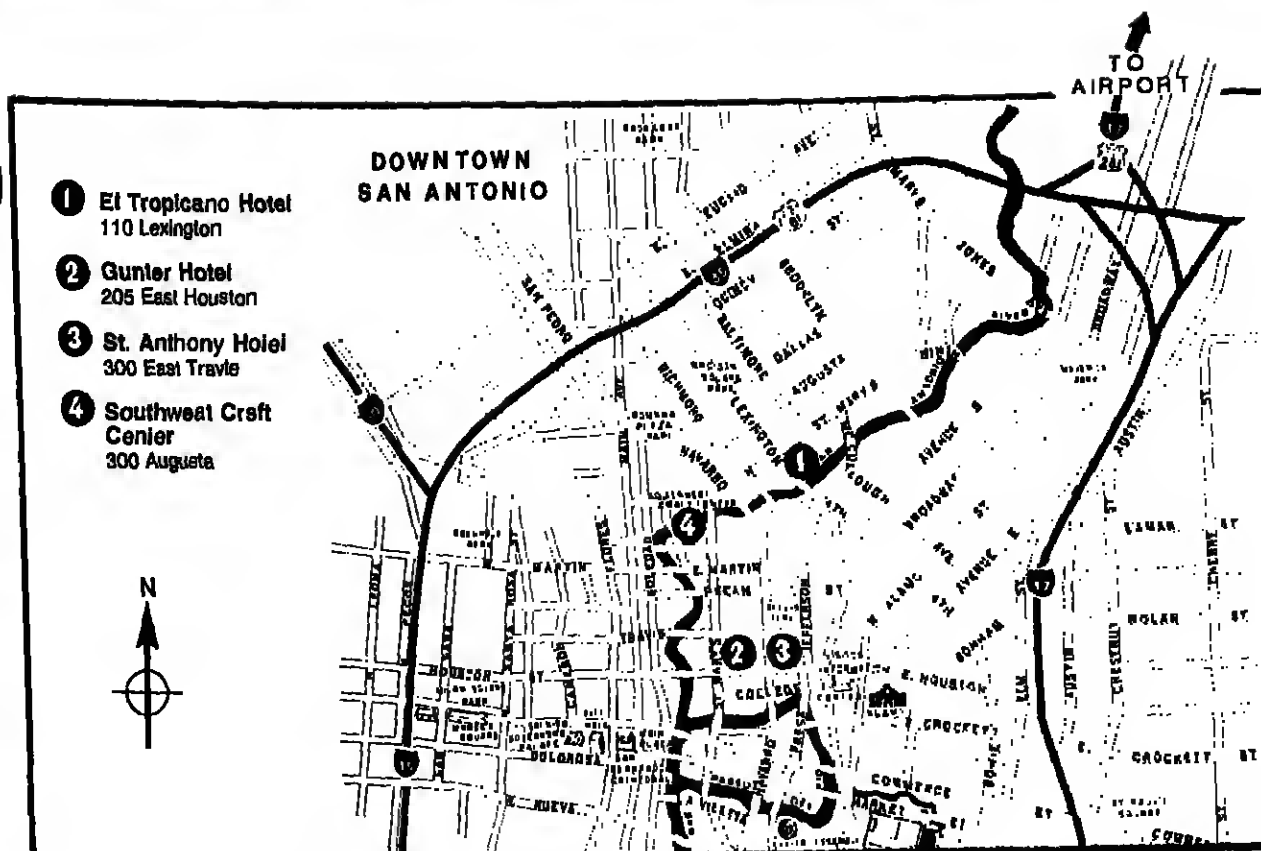
**Social Events.** Complimentary refreshments will be served daily from 9:30 to 10:30 A.M., from 2:30 to 3:30 P.M., and again at the Ice Breaker immediately following the session on Tuesday evening.

A luncheon is planned for Wednesday in the Southwest Craft Center, one of the Southwest's finest examples of French architecture of the late 1800's. Fred Spillhaus, Executive Director of AGU will speak on Society Collaboration—Strength for Ocean Sciences. Reserve early as space is limited. Cost—\$8.75 per ticket.

## Program Summary

All of the sessions will be held in the El Tropicano Hotel.

Tuesday	Particle Fluxes I (AM)	Thursday	Anthropogenic Inputs (AM)
Biological and Physical Processes of Ice Edges (AM)		Feeding Dynamics (AM)	
Ocean-River Interaction (AM)		Particle Fluxes III (AM)	
Large-Lake Processes (AM)		Coastal Processes I (AM)	
Rings (AM)		Climate and Productivity (AM)	
Particle Fluxes II (PM)		Anthropogenic Inputs (PM)	
Biological and Physical Processes of Ice Edges (PM)		Gulf of Mexico Biology and Circulation (PM)	
Ocean-River Interaction (PM)		Particle Fluxes IV (PM)	
Large-Lake Processes (PM)		Coastal Processes II (PM)	
Rings (PM)		Microscale Processes (PM)	
Marine Optics (PM)			
Wednesday	Large Oceanographic Program (AM)	Friday	Microbial Dynamics (AM)
Biogeochemical Cycling (AM)		PROBES (AM)	
SANDS (AM)		Measurement Techniques (AM)	
Small-Lake Limnology (AM)		Coastal Processes III (AM)	
Mesoscale Processes (AM)		Biodegradation (AM)	
Large Oceanographic Programs (AM)		Microbial Dynamics (PM)	
Biogeochemical Cycling (PM)		General Oceanography (PM)	
Oology and Circulation (PM)		Measurement Techniques (PM)	
Small-Lake Limnology (PM)		Traces Metals (PM)	
Mesoscale Processes (PM)		Biodegradation (PM)	



## Ocean Sciences: AGU/ASLO Joint Meeting

February 16-19, 1982  
San Antonio, Texas

## IMPORTANT INSTRUCTIONS

The San Antonio Convention and Visitors Bureau will make hotel assignments upon receipt of the official housing application, provided that it is properly filled out and all necessary information is given. All rooms will be assigned on a first come, first serve basis. All requests must be on this form. Telephone requests are not accepted. OFFICIAL HOTEL CONFIRMATION WILL ADVISE DEPOSIT POLICY. DO NOT SEND MONEY WITH THIS FORM.

Ocean Science Meeting  
American Geophysical Union  
Housing Department  
San Antonio Convention and Visitors Bureau  
P.O. Box 2277  
San Antonio, Texas 78298

Cutoff date for reservations is  
January 15, 1982



**HOTEL-MOTEL PREFERENCE:** Indicate by number (1) (2) (3) (4). Failure to list maximum number of choices will result in delay as form will be returned for additional selections.

El Tropicano Hotel	St. Anthony Hotel	Gunter Hotel	Arrival date
Single \$37	Single \$44	Single \$47	Time _____ a.m. _____ p.m.
Double \$47	Double twin \$50	Double \$51	
3 to a room \$55	Double double \$50	3 to a room \$54	Departure date _____
4 to a room \$63	King \$78	4 to a room \$61	
	3 to a room \$80		

## TYPE OF ACCOMMODATIONS DESIRED

- Single(s) (1 person, 1 bed)
- Double(s) (2 persons, 1 bed)
- Twin(s) (2 persons, 2 beds)
- Multiple(s) (3 persons)
- Multiple(s) (4 persons)
- Suite (1 bedroom; parlor)
- Suite (2 bedrooms; parlor)

List below the names of persons occupying each room (INDICATE THOSE SHARING ACCOMMODATIONS)

NAME	TYPE OF ROOM
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

**MAIL CONFIRMATION TO:** [Please list only one person to receive acknowledgement. If this request is being sent in for a group of people, be sure others do not duplicate.]

PRINT OR TYPE  
Name \_\_\_\_\_ Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
Telephone No. (A.C.I.) \_\_\_\_\_

## RETURN THIS FORM WITH PAYMENT TO:

Meetings Registration  
American Geophysical Union  
2000 Florida Ave., N.W.  
Washington, D.C. 20009

PLEASE PRINT CLEARLY

NAME ON BADGE \_\_\_\_\_  
AFFILIATION \_\_\_\_\_  
MAILING ADDRESS \_\_\_\_\_  
Telephone # \_\_\_\_\_  
Address during the meeting if different than above \_\_\_\_\_

The program and meeting abstracts will appear in the January 18 issue of EOS, which is mailed to all members of AGU/ASLO in advance of the meeting.

## Ocean Sciences: AGU/ASLO Joint Meeting

February 16-19, 1982  
San Antonio, Texas

## REGISTRATION FORM

Days you plan to attend  
☐ Tuesday ☐ Wednesday  
☐ Thursday ☐ Friday

Please check appropriate box  
Members of sponsoring societies may register at the member rates

☐ Member AGU

☐ Member ASLO

☐ Member sponsoring society

☐ AMS-American Meteorological Society

☐ MTS-Marine Technology Society

☐ Nonmember

Nonmembers

The difference between member (or student member) registration and nonmember registration may be applied to AGU dues if a completed membership application is received at AGU by May 19, 1982. Current AGU annual membership rates are: \$20 Members; \$7 Student Members.

Preregistrants

Your receipt will be in your preregistration packet. The registration fee will be refunded if written notice of inability to attend is received in the AGU office by February 8.

Office Use Reference Number

## DEADLINE FOR RECEIPT OF PREREGISTRATION January 29, 1982

(rates applicable only if received by January 28 with payment)

More than one day One day

MEMBER ☐ \$55 ☐ \$27.50

STUDENT MEMBER ☐ \$25 ☐ \$12.50

NONMEMBER ☐ \$75 ☐ \$37.50

STUDENT NONMEMBER ☐ \$32 ☐ \$16.00

ABSTRACTS (January 18, 1982, EOS) \$5

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